



# EMPOWER | INNOVATION | CHAMPIONS 2014 INNOVATION FAIR

## DIVISION OF DESIGN

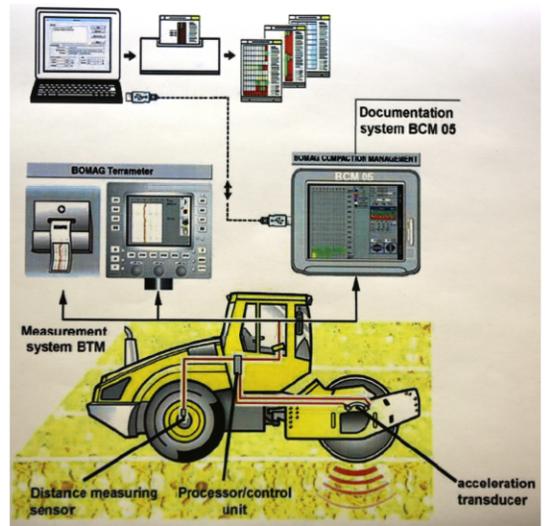
# THE USE OF INTELLIGENT COMPACTION (IC) ON HMA ROADS AND SUBBASES

### Office Of Engineering Services

Engineering Services (ES) is responsible for providing materials recommendations and reports for all the federal and state highways in the District's nine county jurisdiction. This includes, but is not limited to, pavement design using both hot mix asphalt and concrete materials and corrosion investigations for culvert design. Additionally, ES provides materials support as well as forensics studies to Caltrans field personnel in construction and maintenance. ES also operates the Materials Laboratory in addition to the Independent Assurance Sampling and Testing Group that certifies all testers and qualifies labs to perform tests on Caltrans construction projects.

### Intelligent Compaction

The intelligent compaction (IC) system is a compaction technology used for materials including soils, aggregates, and asphalt mixtures, by using vibratory rollers equipped with an in-situ measurement system and feedback control. Rollers are equipped with a real-time kinematic (RTK) Global Positioning System (GPS), a roller-integrated measurement system (normally accelerometer-based), feedback controls, and an onboard real-time display of all IC measurements.



Infra-red temperature sensor on a smooth drum roller



RTK GPS receiver and antenna on a roller

IC rollers maintain a continuous record of measurements that include the number of roller passes, roller-integrated measurement value (ICMV), GPS locations of the roller, roller vibration amplitudes/frequencies, and HMA surface temperatures.

Based on the real time onboard color-coded display of the above measurements, the roller operators can either manually or automatically allow the IC rollers to adjust the machine settings for optimum compaction. ICMV is used to evaluate the level of compaction.

With 100 percent coverage on the compacted area, the IC technology can be used to produce uniformly compacted pavement products that perform better and last longer. The uniqueness of IC is in its ability to adjust to density variances in subsurface or HMA conditions in real time.





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## Benefits of IC Technologies

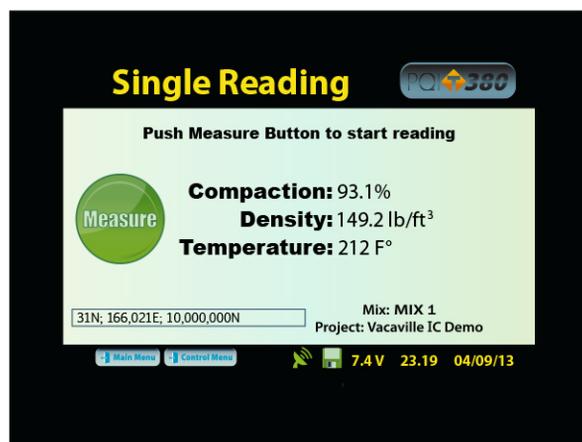
The immediate benefits of intelligent compaction technologies common to both the earthwork and paving include:

- ▶ Mapping of the existing support layers in identifying weak support areas for corrective action prior to the compaction of the upper layers.
- ▶ With hot mix asphalt intelligent compaction, tracking roller passes and hot mix asphalt surface temperatures provide necessary means to maintain a consistent rolling pattern within optimal ranges of temperatures for 100 percent coverage of a construction area.
- ▶ Intelligent Compaction technologies can be especially beneficial to maintain consistent rolling patterns under lower visibility conditions such as night paving operations.

As a result Intelligent Compaction leads to:

- ▶ Improved density
- ▶ Increased productivity
- ▶ Reduction of highway repair
- ▶ Identification of non-compactable areas and
- ▶ Improved depth of compaction

The hope is to one day fully implement this technology in our construction operations to ensure we deliver a quality, long-lasting roadway to our consumer, the motoring public.



A single-drum roller equipped with roller-integrated measurement system on-board display units with software.

